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SUMMARY OF PRP
ADDITIONAL ALTERNATIVE
AND COMPARISON TO
THE EPA CRITERIA

GALENA SUBSITE
CHEROKEE COUNTY SITE, KANSAS

Prepared by

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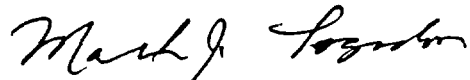
Attention: Mr. Ken Paulsen

Re: Comparison of the PRP's Additional Alternative to the EPA Criteria

Dear Ken:

Please find attached six copies of the above captioned report. We appreciate the extensive assistance that you have provided in the preparation of this report, and trust that it provides the input that is required at this time. Should you have any questions, please do not hesitate to call.

Respectfully submitted,
ADRIAN BROWN CONSULTANTS INC



Mark Logsdon, Hydrogeochemist



Adrian Brown, P.E., President

Att.

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1.0 INTRODUCTION

In February 1988, EPA announced selection of a preferred alternative for the groundwater and surface water operable unit to the Galena subsite of the Cherokee County Kansas CERCLA site. That alternative included as a principal action the milling of mine waste using conventional crushing, grinding and flotation methods, with the placement of the tailing from the milling process into mine voids.

Since that announcement, both EPA and the PRP's have carried out additional test work, and the PRP's have developed a substitute approach for the milling portion of EPA's preferred alternative. This suggested approach, herein referred to as the "Additional Alternative" (in recognition of the fact that EPA has examined many alternatives), consists of the use of conventional earth moving equipment to selectively relocate mine wastes without milling into accessible mine shafts, pits and subsidence areas.

A survey of available void space in the Galena subsite was conducted by Mr. Gary Andes in November 1988. That survey included measurement of depths of water in flooded pits and subsidence areas. Mr. Andes prepared a report entitled "Field Estimate of Available Disposal Space for Surface Mine Wastes at Galena, Kansas", dated November 10, 1988, detailing the results of his survey.

Laboratory leaching tests were carried out under the direction of Adrian Brown Consultants (ABC) following receipt of a testing protocol from EPA in late August, 1988. The results of those tests are described in a report from Adrian Brown Consultants entitled "Results and Analysis of Leaching Tests, Galena Subsite, Cherokee County Site, Kansas", dated December 5, 1988.

In this report, the PRP's have compared the Additional Alternative to the 9 criteria used by EPA, for evaluation of alternatives as described in OSWER Directive Number 9355.0-21 entitled "Additional Interim Guidance for FY '87 Records of Decision", dated July 24, 1987.

2.0 DESCRIPTION OF THE ADDITIONAL ALTERNATIVE

The PRP-suggested Additional Alternative includes the following major aspects that would replace the milling/flotation portion of EPA's proposed remedy:

- o Selectively relocate waste rock and chat into existing mine voids;
- o Place the higher metal content waste rock and chat in flooded shafts and subsidence features below the seasonal-low water table;

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- o Place rock and chat with lower metals content in unsaturated mine voids, placing the lowest metal-content material in zones of fluctuating water table.
- o Place materials with insignificant metals content as the uppermost layer of material in each void in order to eliminate direct exposure to metal-bearing rock.
- o Shape and contour piles to minimize water infiltration to the extent practical.
- o Where locally available, establish a layer of soil/root media on unsaturated zone piles to encourage vegetative growth.

3.0 COMPARISON WITH EPA CRITERIA

Under current Agency guidance, alternative remedial actions are to be evaluated against nine criteria. The following outline discusses the Additional Alternative in terms of 7 of the 9 criteria that can be assessed by the PRPs, with brief notes on the community and state acceptance issues.

In making these comparisons, the PRP's wish to emphasize that they continue to disagree with EPA's assessment of risk for the Galena subsite, and that all pathways of exposure and health and environmental risks mentioned below are not considered by the PRP's to be actual risks or pathways, until and unless evidence is developed so indicating. The point presented in the outline below is simply that if in the future the noted risks should be established, the Additional Alternative would satisfactorily mitigate them. The PRP's continue to believe that the no-action alternative is the proper one.

Where appropriate in the outline below some comparisons to the milling alternative have also been drawn to emphasize similarities or differences.

3.1 IMPLEMENTABILITY

- o Easily implemented, standard earth-moving techniques would be employed.
- o The time span to complete the remedy could be as little as one year or less.
- o Standard earth-moving equipment would be utilized. The only specialized equipment needed would be instrumentation (e.g., x-ray

fluorescence apparatus) for determining metals concentrations in the field.

- o Implementation should be safe and pose minimal risk to construction and supervisory personnel. Materials would be pushed into voids and would not require working inside subsidence zones.
- o Similar earth-moving techniques have been used successfully in the Joplin, Missouri area to rehabilitate mined lands for redevelopment.

3.2 REDUCTION OF MOBILITY, TOXICITY, OR VOLUME

- o To the extent that toxicity due to direct exposure exists, it would be reduced or eliminated as the materials are relocated from surface piles to below-grade voids.
- o To the extent that mobility of materials due to wind erosion constitutes an exposure pathway, that pathway would be reduced or eliminated. Therefore any risk of toxicity that might exist due to inhalation is also reduced.
- o To the extent that mobility of materials due to surface erosion might present an exposure pathway, that pathway would be reduced or eliminated. To the extent that removing the effective pathway also limits total exposure via ingestion, any risk of toxicity that might exist due to ingestion is also reduced.
- o Mobility of metals would be reduced by the disposal of the higher metal content waste materials below the water table, which testing has shown is expected to reduce long-term leaching of the three metals of principal concern to de minimus levels. The Additional Alternative is superior in this respect to the milling option based on both EP Toxicity and column leaching data, due primarily to the fact that under the Additional Alternative particle size would not be significantly reduced, hence surface area of particles would not be increased and "fresh-face" effects would be avoided. Thus, there would not be an increase in availability of metals as would occur with milling of waste rock.
- o Volume of waste materials will not be reduced.

3.3 SHORT-TERM EFFECTIVENESS

- o Direct exposure to materials with high metals content would be quickly eliminated by below-grade placement.

- o To the extent that any inhalation risk exists due to wind-blown particles, that risk would be reduced or eliminated by below-grade placement. Standard dust-suppression techniques can be used as needed during the construction phase to minimize fugitive dust.
- o Risks to workers engaged in the implementation of the remedy would be minimal, as materials would be pushed into voids and would not require working inside subsidence zones. Standard worker safety and industrial hygiene equipment and procedures would provide adequate protection.
- o Limitation of leaching by fully saturating the waste rock and chat would immediately reduce the source for metals to groundwater and ultimately surface water, though the lag time (due to metal already in transit) may not allow easy quantification of this in the short-term.

3.4 LONG-TERM EFFECTIVENESS AND PERMANENCE

- o The Additional Alternative is permanent. Little additional subsidence in the Galena area is likely, since most mining was carried out 75 to 100 years ago. Periodic site inspection would be required to determine if additional earth moving had become necessary.
- o The Additional Alternative is reliable, as it depends primarily on standard earth moving techniques. The milling alternative is less reliable, due to the expected large variations in feed to the process.
- o Neither the Additional Alternative nor the EPA's milling proposal, on their own, would have a substantial impact on the gross hydraulics of the flow system. To the extent that uncrushed waste rock is returned to the original subsurface rubbelized zones, the Additional Alternative most nearly restores the original hydrogeologic setting.
- o Once surficial leaching of particles has occurred, leaching of cadmium, lead and zinc is expected to be very limited, particularly for material disposed of below the water table. Because the Additional Alternative does not involve the crushing and grinding required by the milling alternative, surface area of particles is not increased, fresh faces are not produced, therefore the time needed to complete the leaching of particle surfaces is minimized, though the exact time under natural conditions cannot be predicted with precision. The leaching tests indicate that long-term concentrations in leachate are expected to be at or below the drinking water standards for cadmium, lead and zinc.
- o The minimization of metal leaching by placing higher metal-content waste materials in saturated voids will permanently reduce the

source-term of metals to the groundwater and ultimately to surface water systems. The reduction in source-term concentrations of metals would lead to long-term reductions in both concentration and total mass loading in groundwater and surface water.

- o Continued monitoring will be required to determine the effectiveness of the remedy.

3.5 COST

- o Cost of backfilling and contouring (the Additional Alternative) is expected to be approximately \$2 million, although it must be emphasized that detailed cost estimates would be prepared only during the remedial design phase.
- o The PRP's have estimated the capital and operating costs of the milling alternative to be in excess of \$30 million, notwithstanding that EPA has previously estimated these same costs at about \$2.2 million.
- o EPA previously estimated the cost of contouring at about \$.9 million. That cost would be included in the \$2.0 million approximate cost of the Additional Alternative, as the earth-moving would result in recontouring.

3.6 COMPLIANCE WITH ARARs

- o The detailed remedial action would be designed and engineered to comply with location- and action-specific ARARs.
- o Contaminant-specific ARARs may not be achieved in the short-term for all metals at all disposal locations. However, there is a reasonable expectation - based on the PRP testing reported in the ABC report of December 5, 1988 - that leaching of cadmium, lead and zinc from materials disposed of below the water table will be at concentrations at or below the drinking water standards in the long-term.
- o Note that most other remedies examined by EPA also failed to meet contaminant-specific ARARs in the short-term. In particular, the milled tailings sample tested by the PRP's shows the characteristic of EP Toxicity for lead.

3.7 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

- o Incidental ingestion of surface waste was identified by EPA as the most important exposure pathway for children; although the PRPs disagree with EPA's analysis, the Additional Alternative would promptly eliminate this exposure pathway.
- o Basins that now collect precipitation would be filled and contoured, reducing direct infiltration of fully oxygenated water to mine voids.
- o To the extent that any health or safety hazards might exist due to people swimming in water-filled subsidence areas, those hazards would be eliminated.
- o Leaching of metals to groundwater, with ultimate transportation to streams, would be reduced by disposing of waste materials to fully saturated voids. Particularly for cadmium, lead and zinc, the source-term concentrations will approach or surpass water quality suitable for drinking. The minimization of source-term concentrations will ultimately decrease both concentrations and mass flux of these metals in groundwater and surface water.
- o The PRP's overall assessment, based on the leaching tests described in the ABC report of December 5, 1988, is that the Additional Alternative is at least as protective and probably more protective of health and environment than the milling alternative.

3.8 COMMUNITY ACCEPTANCE

EPA has stated that they will address this criterion. However, the PRPs note that the suggested backfilling program likely will produce land suitable for redevelopment, based on experience in nearby Joplin, Missouri. The recapture of land plus the mitigation of health and safety risks, including groundwater quality improvements as compared to the milling alternative, can be expected to improve property values generally.

3.9 STATE ACCEPTANCE

EPA has stated that they will address this criterion. The PRPs note that the comparative costs and relative ease of implementability of the PRP proposal may be viewed favorably by the State of Kansas, particularly in light of a demonstration that other criteria are positively affected by the Additional Alternative.

4.0 CONCLUSIONS

Although the PRPs continue to believe that the available evidence supports the no-action alternative, and that the no-action alternative should be adopted by EPA, the suggested Additional Alternative is believed to be superior to the milling alternative, as outlined below:

- o The Additional Alternative has significant advantages in implementability
 - standard earth moving equipment would be used
 - work can begin as soon as access problems are resolved - the design period would be short and no construction period is required as would be the case with a mill
 - remedy would be extremely reliable
 - operation can be conducted safely
 - operation can be completed in one year or less
- o The Additional Alternative is at least as protective of human health and the environment, and probably more protective than the milling alternative.
- o The short term and long term effectiveness, and compliance with ARARS are equivalent to the milling alternative. Reduction of the source-term for metals is expected to result in benefits sooner than might be achieved with milling, particularly for lead.
- o The cost is significantly lower
 - The PRP's preliminary cost estimate for the Additional Alternative is about \$2 million
 - The PRP's cost estimate for the milling alternative is in excess of \$30 million

